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LOSS ASSESSMENT OF SEEDBUG AND SEEDWORM DAMAGE IN ORCHARDS HARVESTING WITH NETTING

by

Huey N. Wallace and Julie C. Weatherby[1/]

Abstract

The seedbug populations (Leptoglossus corculus and Tetyra bipunctata) in 1983 were low. Identifiable seedbug feeding accounted for 7% and 28% of the damaged seed from handpicked and caged cones, respectively, at the Erambert Seed Orchard. At the Stuart Seed Orchard, seedbug feeding accounted for 3% and 19% of the damaged seed from handpicked and caged cones, respectively. There were no seedworms (Cydia spp.) found in the cones from the Stuart Orchard. Six percent of the sampled cones from the Erambert Orchard had seedworm damage.

INTRODUCTION

The use of netting to collect loblolly pine seed in seed orchards is increasing throughout the Southeast. Major differences exist in the netting and traditional handpicking methods of harvesting. These differences may result in increased losses caused by seedbugs, Tetyra bipunctata (Herrick-Schaffer), and Leptoglossus corculus (Say). Also, fewer seed may be harvested as a result of the tendency of some cones to remain closed well into the harvest season.

The netting method of seed collection allows the cones to open naturally. A tree shaker is used to dislodge as many seeds as possible. The seeds fall onto netting which has been placed on the orchard floor during late September or early October. The netting and the fallen seeds remain on the orchard floor until mid-December or mid-January. Seeds collected by netting are exposed to seedbug feeding for approximately two and a half to three months longer than seeds extracted from cones harvested by the traditional handpicking method.

[1/] Biological Technician and Entomologist, respectively, USDA Forest Service, Southern Region, State and Private Forestry, Forest Pest Management, Pineville, LA 71360.

When cones are handpicked, they are opened by a combination of heat and air, the seeds extracted, and the the cones destroyed. However, with netting the cones remain on the tree. Seedworms (Cydia spp.) overwinter in the axis of the cones. Because infested cones remain in the orchard the potential may exist for population increases.

OBJECTIVES

The objectives of this project were 1) to design and construct a seed trap which could be used to assess seedbug damage and 2) to begin monitoring seedbug and seedworm losses under simulated net harvesting methods.

METHODS

Trap Design

In order to evaluate if additional seedbug damage was occurring, a trap was developed that would catch seeds from individual cones without allowing seeds from other cones to enter the trap. The trap allowed seedbugs to enter and exit at will.

Prototypes of two traps were built and hung in pine trees in Feburary, 1983. The framing of one trap was constructed from dry cypress wood, the other frame from aluminum clothes line wire. Both frames were covered with fiber screen.

Loblolly pine seeds were placed in each trap. The traps were attached to pine branches (3/4" to 1" in diameter) growing 0° to 20° above horizontal. Weather striping, 3/4" wide by 1/2" thick, was wrapped around the branch 11" apart, above and below the cone cluster. Each trap was placed around the cone cluster with the frame contacting the center of the weather stripping. Two 3/8" by 1" long coil springs with a hook on each end were used to hold the trap in place.

Both traps held the seed even in the March wind; however, the wooden frame absorbed moisture from the rain. The extra weight caused the branch to bend downward. The aluminum clothes line wire trap (Figure 1) utilized light weight material and did not cause any limb droop. This trap was easy to construct, and could be reused. Because of these advantages the wire frame trap was selected for field testing.

Field Test

On September 23, 1983, 2 traps were hung in each of 10 clones of the Alabama loblolly seed source at the Erambert Seed Orchard, Brooklyn, Mississippi. On September 30, 1983, 2 traps were hung in each of 10 clones of the Louisiana loblolly seed source at the Stuart Seed Orchard, Pollock, Louisiana.

Figure 1. Clothes Line Wire Trap used at the Stuart and Erambert Seed Orchards.

After the traps were installed and the total number of caged cones were recorded, an equal number of cones were picked from each ramet. These picked cones were placed individually in paper bags. The bags were placed on wooden palates in a screen house until February.

The traps were removed from the Erambert on January 17, 1984 and from the Stuart on January 31, 1984. The trees at the Erambert had not been shaken when the traps were removed. The trees at Stuart were shaken on December 7 and January 6, 1984 by a shock wave tree shaker.

Immediately before removing each trap the seeds, which had fallen from the caged cones and had been captured by the trap, were removed from the trap and placed in a paper bag. The caged cones were picked and placed in a second paper bag.

The picked cones were kiln dried. The seeds from all open cones were extracted, dewinged, and counted. The seeds remaining in the caged cones were extracted, dewinged, and counted. Finally the seeds which had been removed from the cages were dewinged and counted.

The seeds from handpicked and caged cones were floated in water to separate the full and empty or damaged seeds. The full seeds sank while the empty or damaged seeds floated. The empty or damaged seed were counted, and the total number of full seeds recovered from each batch was calculated by subtracting the number of empty or damaged seeds from the total number of seeds previously recorded. Subsamples of both full and empty or damaged seeds from both orchards were radiographed to determine if the flotation method successfully separated the full seed.

Sub-samples of both full and empty seeds from both orchards were radiographed to determine seedbug damage.

Most of the cones (handpicked and caged) were cut in half, then quartered to expose seedworm larvae.

RESULTS AND DISCUSSION

Twenty of the 40 traps met the performance criterium. Acceptable performance was defined as a seed recovery rate equal to the mean number of seed per handpicked cones minus 1 standard deviation.

The traps attached to large (3/4" to 1" diameter) branches worked well. Traps attached to small (1/2" diameter) branches spun around on the branch dumping seed. Traps attached to branches that angled up 30° or more, dumped seed when the wind pushed the branch almost straight up.

Forty cones were caged at the Erambert Seed Orchard. A total of 771 seeds were captured by the traps and 81% of these seeds (625 seeds)

were full. An additional 4,164 seeds remained in the cones and 88% of these seeds (3,681 seeds) were full. Approximately 85% of the full seeds produced by the 40 caged cones remained in the cones. Table 1 lists by clone the total number of seeds, the number of full seeds, and the average number of full seeds per cone remaining in the caged cones.

At the Stuart Seed Orchard, 45 cones were caged and a total of 2,695 seeds were captured by the traps. Eighty-eight percent of these seeds were full. An additional 1,060 seeds remained in the cones and 82% of these seeds (872 seeds) were full. Approximately 27% of the full seeds remained in the cones. Table 2 lists by clone the total number of seeds, the number of full seeds, and the average number of full seeds per cone remaining in the caged cones.

Based upon these results, the potential 1983 seed crop would have been reduced by 85% and 27% at the Erambert and the Stuart Seed Orchards, respectively. Apparently the tree shaking procedures used at the Stuart Seed Orchard dislodged some of the seeds which would have remained in the cones. The higher percentage of the seeds remaining in the cones at the Erambert was due to the removal of the cages prior to shaking.

The radiographs of sub-samples taken from empty or damaged seeds from the Erambert Seed Orchard indicated that seedbug feeding damaged 7% of these seeds from handpicked cones and 28% of these seeds from caged seed. Similar procedures at the Stuart Seed Orchard indicated that seedbug feeding accounted for 3% of the damaged seed from handpicked cones and for 19% of the damaged seed from caged collections.

At the Erambert Seed Orchard, 4 cones (6%) of the 65 sampled had a total of 6 seedworm larvae. No seedworm larvae were found at the Stuart Seed Orchard. These infestation rates represent baseline data for a single year. By continuing to monitor seedworm infestation rates in areas where net harvesting methods are employed, it should be possible to determine if this harvesting method will result in population increases.

Loss assessment statistics discussed in this report were compiled from data obtained from all traps. Therefore statistics, derived from trapping efficiency data, should be considered preliminary.

RECOMMENDATIONS

Five traps with 100 seed in each should be placed on branches that angle up from 30° to 65°. The branches should be pulled down as near as possible to 0° and held by a nylon cord. Five traps with 100 seed in each should be placed on small (1/2" diameter and below) branches using different thickness of weather stripping (1/2" to 1" thick).

Table 1. Seeds Remaining in Caged Cones at the Erambert Seed Orchard, 1983

Clone	No. Cones	Seed Left in Cones		
		Total No.	Total No. (Full)	Avg./Cone (Full)
47	5	533	499	99.8
49	3	401	358	119.3
6	5	1061	953	190.6
10	5	324	304	60.8
19	4	301	243	60.8
21	6	494	453	75.5
45	4	485	439	109.8
1	3	191	163	54.3
8	5	374	269	53.8
Total	40	4164	3681	92.0

Table 2. Seeds Remaining in Caged Cones at the Stuart Seed Orchard, 1983.

Clone	No. Cones	Seed Left in Cones		
		Total No.	Total No. (Full)	Avg./Cone (Full)
37	5	91	64	12.8
31	4	219	183	45.8
42	4	94	76	19.0
44	3	179	161	53.7
30	5	210	174	34.8
34	6	62	43	7.2
45	4	64	46	11.5
49	4	19	16	4.0
2	4	24	22	5.5
1	6	98	87	14.5
Total	45	1060	872	19.4

After sixty days the seed should be recounted. If an acceptable number of seed remain in the traps, an evaluation of seedling and seedworm damage should be repeated yearly for the next five years in at least two orchards.

Every orchard that utilizes the netting method of harvesting should cut 10 cones from each clone and examine for seedworm larvae. This should be repeated for 5 years to see if the population is increasing.

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Prepared by: Huey N. Wallace
Biological Technician

Julie C. Weatherby
Entomologist

Approved by: Wm B. Thomas
for HARVEY V. TOKO
Staff Director
Forest Pest Management

SOUTHERN REGION, STATE AND PRIVATE FORESTRY
USDA, FOREST SERVICE, ATLANTA, GA 30367